Claims

1. Proportional pressure-regulator valve for regulating a pressure level in a hydraulic circuit, comprising one armature rod (5) as connection between one control element situated in the hydraulic circuit and the proportional magnetic (1) in one housing (11) which consists of one magnetic core, one magnetic armature (3) and one magnetic core(4) wherein

- said magnetic coil (4) and said magnetic core are firmly connected with said housing (11) and
- in the interior of said magnetic oil (4) said magnetic armature (3) can be moved back and forth axially between two end positions by a magnetic force existing within one gap (12) between said magnetic armature (3) an said magnetic core and
- said magnetic core partly projects into the interior of said magnetic coil (4) and at the same time is situated concentrically an axially movably around said armature rod (5) firmly connected with an end of said magnetic armature (3) and
- the motion of said magnetic armature (3) results in an actuation of said control element,

characterized in that said proportional magnet (1) has a second adjustable gap (10) for regulating the magnetic force.

2. Proportional pressure-regulator valve according to claim 1, characterized in that said magnetic core consists of at least one first part (2) and one second part (6) provided coaxially with said armature rod (5).

3. Proportional pressure-regulator valve according to claim 1 or 2, characterized in that said second part of said magnetic core (6) is provided axially between said first part of said magnetic core (6) and said housing (11) forming a second adjustable air gap (10) for said first part of said magnetic core (2).

4. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said first part of said magnetic core (6) is

disposed axially movably and concentrically around said armature rod (5) and the motion of said second part of said magnetic core (6) results from a pressure force.

5. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that to produce the pressure force, one shift valve (13), which can be non-positively laid on said second part of said magnetic core (6), is provided and the pressure force is axially passed via said shift valve (13) to said second part of said magnetic core (6).

6. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said shift valve (13) is made of non-magnetic material and is axially movably and concentrically disposed around said armature rod (5).

7. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that the pressure force can be produced hydraulically, pneumatically, or mechanically.

8. Proportional pressure-regulator valve according to claim 7, characterized in that said shift valve (13) is actuated in proportion respectively to a load requirement and a hydraulic pressure in the hydraulic circuit.

9. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said shift valve (13) is designed as hollow cylindrical sleeve which is located in one hole of said housing (11) and seals it as oil-tight as possible.

10. Proportional press-regulator valve according to claim 9, characterized in that said shift valve (13) has on one front side a substantially annular pressure surface which is connected with a feed line (16) of the hydraulic circuit and can be loaded with a hydraulic pressure force.

11. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said second part (6) and said first part (2) of said magnetic core have corresponding contact surfaces (7, 8) the design of which in the second gap (10) produces a radial magnetic field line crossing between said second part (6) and said first part (2) of said magnetic core.

12. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said contact surface (7) of said first part of said magnetic core (2) is situated upon an outer cone.

13. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that said contact surface (8) of said second part (6) of said magnetic core is designed upon an inner cone.

14. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that in said housing (11) a breather hole (15) is provided which ventilates the space formed by said shift valve (13), said second part of said magnetic core (6) and said housing (11).

15. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that between said second part (6) and said first part (2) of said magnetic core (6), concentrically with said armature rod (5), one pressure spring (9) is disposed which produces a spring tension between respectively said second part (6) and said first part (2) of said magnetic core and said shift valve (13) and said spring tension counteracts the hydraulic pressure force.

16. Proportional pressure-regulator valve according to any one of the preceding claims, characterized in that a non-magnetic disc (17) is provided which firmly connects first part of said magnetic core (2) with said housing (11).

17. Method for regulating a pressure level in a hydraulic circuit with one proportional pressure-regulator valve comprising

- one armature rod (5) for connecting a control element located in the hydraulic circuit with
- one proportional magnetic which consists of one magnetic core, one magnetic armature (3) and one magnetic coil (4) said magnetic armature (3) being axially movable back and forth between two end positions by a magnetic force existing in an air gap (18) and the magnetic force depending on a magnetic flow in a magnetic circuit which is adjustable by the height of an electric current laid on said magnetic coil (4),

characterized in that a magnetic core is used which consists of at least one first part (2) and one second part (6) whereby in the magnetic circuit a second gap (10) can be created so that a magnetic resistance generates which regulates the magnetic force.

18. Method according to claim 17, characterized in that said second gap (10) is adjustable by moving a second part of said magnetic core (6) coaxially with said armature rod (5).

19. Method according to claim 17 or 18, characterized in that said second part of said magnetic core (6) is movable by means of a shift valve (13) which is actuated hydraulically, pneumatically or mechanically.

20. Method according to any one of claims 17 to 19, characterized in that said shift valve (13) can be actuated by a hydraulic pressure proportional to a load requirement in the hydraulic circuit and thus the magnetic force can be adjusted depending on the electric current flowing into said magnetic coil (4) and the load requirement in the hydraulic circuit.

21. Method according to any of claims 17 to 20, characterized in that as the width of said air gap (10) diminishes, the magnetic resistance in the magnetic circuit becomes weaker and thus the magnetic force can be adjusted between said first part of said magnetic core (2) and magnetic armature (3).

22. Method according to any one of claims 16 to 20, characterized in that between said second part (6) and said first part (2) of said magnetic core one pressure spring (9) is situated which as the hydraulic force diminishes on said second part of said magnetic core (6), the latter moves away from said first part of said magnetic core (2) so that said second gap (10) between said part (6) and first part (2) of the magnetic core becomes enlarged and the magnetic force diminishes.